

Results: An estimated 8883 TAD_B repairs were identified, with 7456 open (84%) and 1427 endovascular (16%; Table I). Of these, 49 patients were converted from endovascular to open. Patients in the endovascular group were older with greater comorbidities, although only hypertension and peripheral vascular disease were statistically significant. In hospital mortality was 18.9% for open repair vs 10.1% for endovascular repair (Table II) with an odds ratio of 2.25 (95% confidence interval, 1.32-3.81; $P < .01$). Cardiac complications (14% vs 6%, $P < .01$), genitourinary complications (7% vs 2%, $P < .05$), and hemorrhage (14% vs 3%, $P < .01$) were all more frequent in the open repair group. The median in-hospital length of stay was also greater in the open repair group (10.05 vs 7.8 days, $P < .01$).

Conclusions: For patients with a diagnosis of TAD_B who undergo repair, the endovascular approach is being used for, on average, older patients with greater comorbidities yet has reduced morbidity and mortality.

Staged Total Exclusion of the Aorta for Chronic Type B Aortic Dissection: A Case Report

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Background: Hybrid techniques for repair of extensive thoracoabdominal aneurysms have been previously described. Variable lengths of the thoracic and abdominal aorta have been excluded or replaced using these techniques with good outcomes. The most feared complication of this approach is spinal cord ischemia, as intercostal arteries are not reimplemented. We describe a five-stage endograft repair of a complex, chronic Stanford type B aortic dissection.

Case report: A 50-year-old man with a history of a chronic type B aortic dissection developed aneurysmal dilatation of the proximal descending thoracic aorta (maximum diameter, 7 cm). The dissection extended into both iliac arteries. The celiac trunk, superior mesenteric artery, and left renal artery were perfused by the false lumen. The infrarenal abdominal aorta measured 5.3 cm. He was treated initially with a proximal thoracic endograft and carotid-subclavian bypass. A type IA endoleak required proximal extension with exclusion of the aortic arch and ascending aorta-innominate and left carotid bypass. An abdominal endograft was deployed simultaneously to compress the false lumen in the aneurysmal infrarenal aorta. An endoleak in the left iliac limb and progression of the dissection in the right internal iliac artery required bilateral iliac limb extensions. A surveillance computed tomography (CT) angiogram revealed persistent perfusion of the false lumen through perivisceral fenestrations. All therapeutic options were re-evaluated, including medical management, and a hybrid procedure was performed to exclude the descending and perivisceral aorta. Mesenteric and bilateral renal bypass grafts originating from the external iliac artery were performed, followed by endografting of the remaining descending thoracic and abdominal aorta (Fig). Spinal cord protective measures, including spinal



Fig 1. Reconstructed computed tomography imaging shows the entire native aorta and iliac arteries to the external iliac branches have been excluded with endografts.

fluid drainage and lower extremity motor-evoked potential monitoring, were used during the case. The patient did not have any neurologic sequelae and made an excellent postoperative recovery. A subsequent CT angiogram confirmed thrombosis of the false lumen with no endoleak.

Conclusion: Chronic aortic dissection with aneurysmal enlargement results in complex aortic pathology. Hemodynamic changes that occur when the aorta is excluded in segments are sometimes unpredictable due to multiple fenestrations throughout the dissected aorta. In this case, the aorta was excluded from the ascending arch to both external iliac arteries using endografts, without spinal cord complication. The aortic arch branches, visceral, and renal arteries were bypassed using this hybrid technique. To our knowledge, this is the first reported case in which the entire native aorta and iliac arteries to the external iliac branches were excluded with endografts. This case report illustrates the feasibility of the hybrid technique in selected patients when confronted with complex aortic pathology.

Table. Procedures performed

Stage	Procedure	Device(s)	Time (d)
1	Left carotid-subclavian bypass and thoracic endograft of proximal descending aortic aneurysm	6-mm ePTFE bypass graft; Medtronic Talent 46 × 46 × 110-mm proximal main body and 46 × 44 × 110-mm distal main body	0
2	(a) Proximal extension of the thoracic endograft with exclusion of the aortic arch and ascending aorta-innominate and left carotid bypass; (b) repair of infrarenal abdominal aortic dissection and aneurysmal dilatation with modular bifurcated aortic stent graft with one docking limb	(a) Bifurcated bypass graft (10 × 8 mm) from ascending aorta to innominate and left carotid arteries; proximal thoracic extension main body (46 × 46 × 110 mm); (b) Medtronic AneuRx endograft (24 × 135 mm) with one docking limb	3
3	(a) Repair of type IB endoleak with extension graft to left external iliac artery; (b) balloon angioplasty of distal landing zone of TEVAR	Medtronic AneuRx iliac limb extension (16 × 135 mm)	55
4	(a) Repair of right internal iliac artery dissection and aneurysmal dilatation with limb extension of EVAR to right external iliac artery; (b) distal extension cuff to TEVAR to seal type IB endoleak	(a) AneuRx iliac limb extension (16 × 115 mm); (b) distal thoracic main body extension (Medtronic Talent 46 × 46 × 110 mm)	59
5	Mesenteric and bilateral renal bypass from the external iliac artery and endografting of descending thoracic and perivisceral aorta	12 × 6-mm and 14 × 7-mm bifurcated ePTFE grafts; distal thoracic extension (Medtronic Talent 40 × 36 × 110 mm and 42 × 38 × 110 mm) proximal abdominal extension (Talent 40 × 36 × 110 mm)	99

EVAR, Endovascular aneurysm repair; ePTFE, expanded polytetrafluoroethylene; TEVAR, thoracic endovascular aortic repair.

Revascularization of the Left Subclavian Artery during TEVAR Utilizing a Percutaneous In-Situ Technique

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Background: We report the use of retrograde in situ laser-assisted endograft fenestration during thoracic endovascular aortic repair.

Methods: A 69-year-old man presented with a pseudoaneurysm just distal to the left subclavian artery. Ten years previously he was involved in a motor vehicle accident. He was complaining of chest pain and left shoulder pain. During the workup of acute coronary syndrome, a peripherally calcified pseudoaneurysm measuring up to 3.9 cm involving the posteromedial aspect of the distal aortic arch was identified (Fig 1). Old fractures of the pubic rami, left ribs, and left clavicle were also identified compatible with prior chest trauma.

Results: Endovascular thoracic aneurysm repair was elected with revascularization of the left subclavian artery. The patient had a dominant left vertebral and also was left hand-dominant. Because of the clavicular fracture and multiple rib fractures on the left, in situ stent graft fenestration was performed rather than carotid subclavian bypass to avoid the area of previous trauma. The proximal and distal neck landing zones measured 31 mm in diameter. The proximal neck length was only 10 mm distal to the left subclavian artery, necessitating coverage. A 36-mm Talent (Medtronic, Santa Rosa, Calif) thoracic stent graft was deployed, with the covered portion extending to the left carotid artery with the Free-Flo spring over the left carotid artery. A 2.3-mm Turbo excimer laser (Spectranetics, Colorado

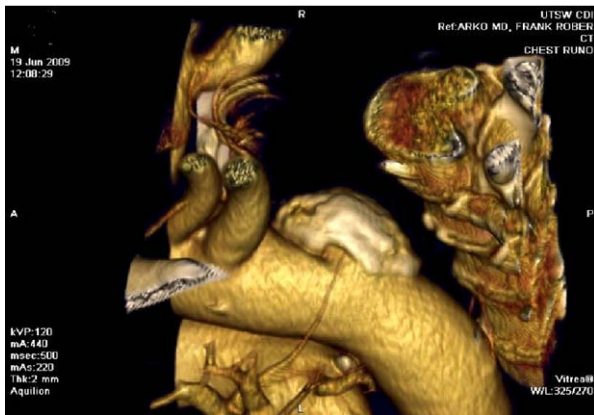


Fig 1. A peripherally calcified pseudoaneurysm measuring up to 3.9 cm involving the posteromedial aspect of the distal aortic arch was identified.

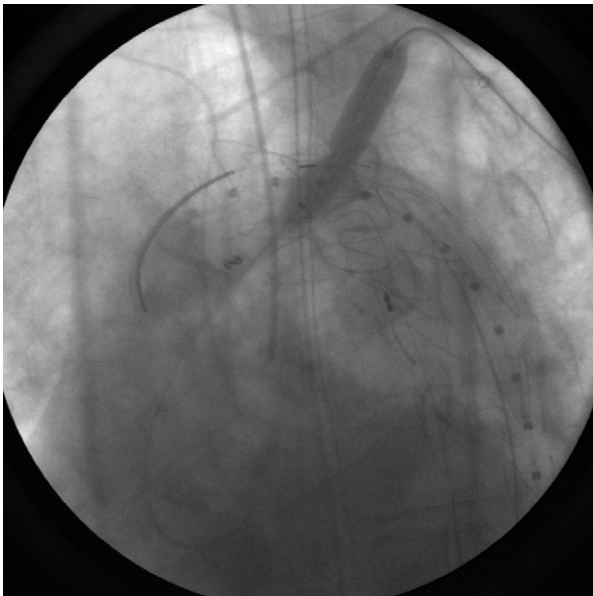


Fig 2. The fenestration was dilated and stented with an 8 × 38 mm stent.



Fig 3. The aneurysm being completely excluded with a widely patent left subclavian stent.

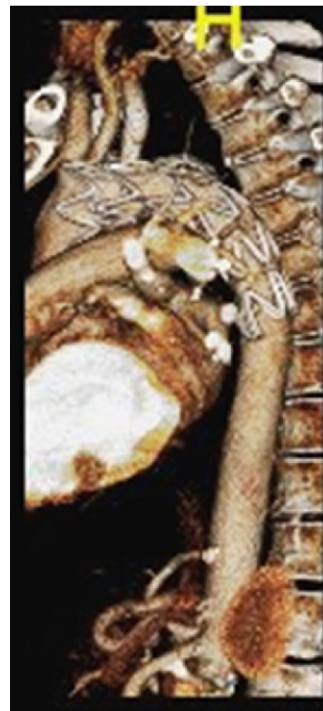


Fig 4. The aneurysm was completely excluded with a widely patent left subclavian stent.

Springs, Colo) was advanced through a 7F sheath from a left brachial approach and used to fenestrate the stent graft under fluoroscopic guidance. The fenestration was dilated and stented with an 8 × 38 mm iCast stent (Atrium, Hudson, NH; Fig 2). The stent was flared proximally and distally for seal. The patient tolerated the procedure well and was discharged home on the second postoperative day. There was no pressure gradient between the upper extremities on follow-up evaluation, with the aneurysm being completely excluded with a widely patent left subclavian stent (Fig 3 and 4). The patient's left chest and shoulder pain completely resolved.

Conclusions: In situ fenestration using the excimer laser allows for rapid branch management of the aortic arch vessels and minimizes the need

for surgical reconstructions. Furthermore, this technique may be helpful as a bailout maneuver for a misplaced endograft. The long-term durability of this procedure is unknown and requires further study.

Cutting Balloon Angioplasty to Relieve Femoral Artery Occlusion Associated with a Vascular Closure Device

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Background: Vascular closure devices have been increasingly used in the setting of endovascular arterial procedures to achieve rapid hemostasis, avoid the discomfort of manual compression, and accelerate patient recovery. These devices are not without complication, however; among them is arterial occlusion. Treatment of such complications has traditionally required open surgical repair, which is often undesirable given the comorbidities common to patients undergoing such procedures. We describe two cases of femoral artery occlusion secondary to the use of suture-mediated vascular closure devices successfully treated with cutting balloon angioplasty.

Case report: Patient 1. A 79-year-old woman developed a cold, pulseless right lower extremity immediately after coronary angiography through right femoral access. A Perclose vascular closure device (Abbott, Abbott Park, Ill) had been used to close the site of the arterial puncture. Angiography from the contralateral groin confirmed occlusion of the right common femoral artery (Fig 1, A). The occlusion was successfully traversed with a guidewire. Initially, standard angioplasty of the lesion was attempted, without improvement. Repeat angioplasty using a 7-mm cutting balloon (Boston Scientific, Letterkenny, Ireland) resulted in complete restoration of arterial luminal patency and normal pedal pulses (Fig 1, B). **Patient 2.** A 25-year-old man with a history of congenital heart disease presented with complaints of short distance claudication and numbness in the right leg since a cardiac catheterization was done through a right femoral access 1 day earlier. Again, a Perclose device had been used to close the site of arterial puncture. Duplex imaging confirmed occlusion of the right common femoral artery. Based on our experience with Patient 1, we proceeded directly with angioplasty using a 5-mm cutting balloon from a contralateral approach. The angioplasty was successful in cutting the Perclose suture and resulted in successful re-establishment of right lower extremity flow (Fig 2).

Discussion: Occlusive complications secondary to suture-mediated closure devices are usually the result of inadvertent posterior wall puncture and subsequent apposition of the anterior and posterior walls by the suture during deployment of the device. Therefore, it is not surprising that initial standard balloon angioplasty failed in Patient 1. In fact, further attempts would likely have torn the artery or at best just loosened the suture. In contrast, the atherotomes of the cutting balloon directly addressed the underlying problem by incising and releasing the monofilament suture itself and obviated the need for open surgical intervention in these two patients. To our knowledge, the use of cutting balloon angioplasty for this purpose has not been previously described in the medical literature. Based on our small experience, we believe that this technique has utility in the manage-



Fig 1. A, Angiography from the contralateral groin confirmed occlusion of the right common femoral artery. B, Repeat angioplasty using a 7-mm cutting balloon resulted in complete restoration of arterial luminal patency and normal pedal pulses.

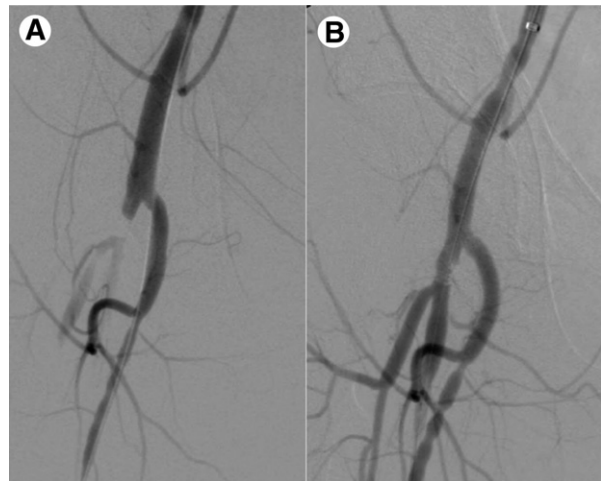


Fig 2. A, Flow to the right lower extremity, which was blocked by the Perclose suture was (B) restored after angioplasty.

ment of patients who develop arterial occlusion after the use of a suture mediated closure device.

Subintimal Snare Technique as a Safe and Reliable Means of Recanulating Chronic Total Occlusions of the Iliacs

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Background: An 87-year-old woman presented with a history of previous right femoral-to-left femoral artery bypass grafting performed for claudication approximately 2 years earlier at a small community hospital. Complicating her postoperative course was difficult wound healing of both groins. She now presented with purulent drainage from the left groin, with evident infection of the prosthetic bypass material.

Methods: Computed tomographic angiography showed chronic total occlusion (CTO) of the left common iliac artery (CIA) as seen previous to the extra-anatomic bypass procedure as well as evidence of the infection incorporating the prosthetic femoral-to-femoral graft. Subsequent angiography was performed with repeat cannulation of the chronically occluded left CIA. Access to the left iliac vasculature was obtained with a cutdown of the patent superficial femoral artery in the mid thigh, well removed from the infected left groin. Attempts to cross the CTO of the left CIA with antegrade and retrograde approaches were complicated by subintimal dissection planes extending beyond the intended treatment site. A subintimal snare technique was therefore incorporated. This involved snaring a Glidewire passed antegrade from the right femoral access with a snare passed retrograde from the left femoral access. The actual snare was performed in the subintimal plane of the left CIA CTO. With successful crossing of the CTO now assured, the lesion was treated with balloon-mounted stenting, resulting in an excellent angiographic and clinical result. The infected femoral-to-femoral bypass graft was subsequently removed, with vein patch angioplasty of both common femoral arteries. The patient had an uneventful recovery. All operative wounds have healed, and normal perfusion has been maintained to both lower extremities.

Results: This case represents a modified endovascular option for treatment of an infected prosthetic graft. Other treatment options would have posed significantly higher complication risks for this patient. The subintimal snare technique incorporated during this case has been reviewed since its inception (within the practice) approximately 26 months ago. During this time, a retrospective analysis reveals that the primary author has treated 22 CTOs of CIAs. Five of these were crossed with relative ease with either direct antegrade or retrograde wire passage. The remaining 17 cases showed evidence of subintimal dissection beyond the target lesion with attempts at simple wire passage. The subintimal snare technique was therefore used in each case without failure. Balloon-mounted stents were used in all cases and successful recannulation was achieved. There were no complications involving extension of dissection beyond the treated lesions. All treatment sites have remained patent, albeit for a fairly short follow-up period. Patent internal iliac arteries beyond the CIA CTOs have been spared with this technique.

Conclusions: The subintimal snare technique used to cross and subsequently recannulate CTOs of CIAs is reliable, safe, and, thus far, a durable means of treatment. This technique assures crossing of CTOs from true